WARM UP:

(Last problem in notes yesterday)

1) Suppose that in a random sample of 36 bottles from a certain bottling machine, the machine filled the bottles with an average of 16.1 ounces of cola. The sample had a standard deviation of 0.11 ounces. Give a 90% confidence interval for the mean number of ounces. Interpret this interval. (Be sure to check conditions first!)

2) I have a confidence interval for a population mean that is

(45.8, 52.7)

(a) what is the sample mean ($\bar{x}$)?

(b) what is the margin of error?

1) n = 36 $\bar{x}$ = 16.1 s = 0.11 df = 35 = n−1

State	Check
1- SRS	1- stated
2- n > 30	2- n = 36 > 30
3- pop > 10n	3- there are more than 360 bottles produced

$16.1 \pm \underbrace{(1.690)}_{t^*\ \text{INVT}}(0.11/\sqrt{36}) = (16.069, 16.131)$

We are 90% confident that the true average ounces of cola in a bottle is between 16.069 and 16.131 oz.

2) (a) $\bar{x}$ 49.25 units (b) m= 3.45 units

HOMEWORK:

1) n = 85 $\bar{x}$ = 15 s = 4 μ = 12 α = 0.04

State	Check
1) SRS	1) stated random sample
2) n ≥ 30	2) n = 85 > 30
3) pop ≥ 10n	3) there are more than 850 5th graders

Ho: $\mu = 12$

Ha: $\mu > 12$

$t = \dfrac{15 - 12}{\frac{4}{\sqrt{85}}} = 6.915$

P(t > 6.915) = 4.267×10^{-10} df = 84

tcdf(6.915, E99, 84)

We reject Ho b/c p-value of $4.267 \times 10^{-10} < \alpha = 0.04$.

We have sufficient evidence that the true average # of pushups that 5th graders can do is greater than 12 pushups.

2) State & Check done above... no need to re-do

$15 \pm \underbrace{(2.372)}_{\text{INVT}}(4/\sqrt{85}) = (13.971, 16.029)$

We are 98% confident that the true average # of pushups that 5th graders can do is between 13.971 pushups and 16.029 pushups

3) α = 0.05

(a) p-value = 0.02 *significant = reject Ho*

YES significant YES reject Ho

(b) p-value = 0.09

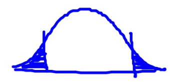
NO, not significant NO, don't reject Ho

COMPLETE #4 -- 6 on the worksheet

(4) n = 120 $\overline{x} = 66$ s = 1.5 $\alpha = 0.05$

State:	Check:
1) SRS	1) stated
2) $n \geq 30$	2) $n = 120 \geq 30$
3) pop $\geq$ 10n	3) there are more than 1200 women 18-23

Ho: $\mu = 63.5$
Ha : $\mu \neq 63.5$



$t = \dfrac{66 - 63.5}{1.5/\sqrt{120}} = 18.257$

$2 * P(t > 18.257) = 2.65 \times 10^{-36}$ df = 119

- We reject Ho b/c p-value of $2.65 \times 10^{-36} < \alpha = 0.05$.

- We have sufficient evidence that the true average height of women ages 18 - 23 is ***not*** 63.5".

(5) Checks- done in the problem above.

$66 \pm \underbrace{(1.658)}_{\text{INVT}}(1.5/\sqrt{120}) = (65.773, 66.227)$

We are 90% confident that the true average height of women ages 18 - 23 is between 65.773" and 66.227".

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(6) confidence interval = (89.4, 122.5)

(a) $\overline{x} = 105.95$ units

(b) m = 16.55 units

Cheat sheets!

t^* — INVT program

p-value < α → reject Ho

tcdf(LB,UB,df)

Ho: μ=claim $\overline{x}$=sample

CALCULATOR STUFF:

Percentages (Z):

Confidence Interval = 1 prop Z Int $\hat{p} = \frac{x}{n}$

Test of Significance = 1 prop Z test

Averages (t):

Confidence Interval = T-Interval

Test of Significance = T-Test

EXAMPLES:

1) Airlines now charge more money for luggage over 50lbs. They do this because they claim that people have luggage that is on average 50 lbs. We want to see if people tend to have luggage that is heavier than 50 lbs. We take a random sample of 62 pieces of luggage and find a mean weight of 52.8 and a standard deviation of 3.2 lbs. Test the claim at the 0.05 level of significance.

$\mu = 50$
$n = 62$
$\bar{x} = 52.8$
$S = 3.2$
$\alpha = 0.05$
$df = 61$

Conditions ✓

$H_o: \mu = 50$
$H_a: \mu > 50$

$$t = \frac{52.8 - 50}{3.2/\sqrt{62}} = 6.89$$

$$P(t > 6.89) = 1.792 \times 10^{-9}$$

- Reject Ho....
- Suff. evid that avg > 50.

2) Using the data in the previous problem, create a 90% confidence interval & interpret.

Conditions ✓
df ✓

$$52.8 \pm (1.670)\left(\frac{3.2}{\sqrt{62}}\right)$$

$$= (52.121, 53.479)$$

We are 90% conf that....

3) The Admissions Office at a large University wants to see what the average IQ score is for their class of incoming freshman. They take a random sample of 54 incoming freshman and find the average IQ score is 112 points with a standard deviation of 15 points. Create and interpret a 98% confidence interval.

$n = 54$
$\bar{x} = 112$
$S = 15$
$C = 98\%$

Conditions ✓

$df = 53$

$$112 \pm (2.399)\left(\frac{15}{\sqrt{54}}\right) =$$

$$= (107.10, 116.90)$$

We are 98% confident that the true average IQ score of incoming freshman @ the University is btw. 107.1 pts and 116.90 pts.

4) The director of the Admissions office in the previous problem claimed to parents of incoming freshman that their students had an average IQ score of 125 points. We think he is over-exaggerating the IQ score of the students. Test his claim (whether the average is actually lower than he claims).

Conditions ✓
df ✓

$H_o: \mu = 125$
$H_a: \mu < 125$

$$t = \frac{112 - 125}{15/\sqrt{54}} = -6.369$$

$$P(t < -6.369) = 2.333 \times 10^{-8}$$

We reject Ho b/c p-value of $2.333 \times 10^{-9} < \alpha = 0.05$. We have sufficient evidence that the avg. IQ score of freshman @ the University is less than 125 pts.

5) A recent random sample of 1100 teenagers was asked if they play online video games. 775 answered yes. Construct a 95% confidence interval for the true percent of teenagers who play online video games.

$n = 1100$

$\hat{p} = \frac{775}{1100} = 0.705$

$C = 95\%$

$$0.705 \pm (1.96)\sqrt{\frac{(0.705)(0.295)}{1100}}$$

$$= (0.67758, 0.73151)$$

We are 95% conf that...

6) A random sample of 1500 American adults asked about attitudes towards alternative medicine (acupuncture, massage therapy, herbal therapy, etc.). 660 people in the sample said they would use alternative medicine if traditional medicine was not working for them. An article in the Journal of Modern Medicine had claimed that only 1/3 of adults would use alternative medicine. Does the sample provide evidence that the percent is actually higher than the Journal thinks? Use a significance level of 0.01.

$n = 1500$
$\hat{p} = \frac{660}{1500} = 0.44$
$p = 1/3$
$\alpha = 0.01$

Conditions ✓

$H_o: p = 0.333$ $\quad$ $H_o: p = 1/3$
$H_a: p > 0.333$ $\quad$ $H_a: p > 1/3$

$$z = \frac{0.44 - 0.333}{\sqrt{\frac{(0.333)(0.667)}{1500}}} = 8.764$$

$$P(z > 8.764) = 9.588 \times 10^{-19}$$

Reject Ho.... Suffic. evid. that % is higher than 1/3.